

Att'y Ref. No. 003-090

U.S. App. No.: 10/676,099**REMARKS**

Favorable reconsideration, reexamination, and allowance of the present patent application are respectfully requested in view of the foregoing amendments and the following remarks. Support for the foregoing amendments can be found throughout the present application, including paragraphs [0015] and [0023], and the original claims.

Withdrawal of Claims

Applicant acknowledges the withdrawal of Claims 11-14, 16, and 17 from consideration at this time, pursuant to the Restriction requirement memorialized in the Office Action.

Objection to the Drawings

At page 3 of the Office Action, the drawings were objected to under 37 C.F.R. § 1.84 because Figures 3-5 allegedly did not adequately identify their graphs' units. Applicant respectfully requests reconsideration of this objection.

Applicant first notes that the specification, at paragraphs [0039] - [0041], provides the units of measure for the graphs depicted in Figs. 3-5, and that Fig. 5 includes those units. Nevertheless, Applicant files concurrently herewith a single Replacement Sheet, including Figs. 3 and 4 with the units identified in the aforementioned paragraphs of the specification.

For at least the foregoing reasons, Applicant respectfully submits that the drawings fully comply with 37 C.F.R. § 1.84, and therefore respectfully requests withdrawal of the objection thereto.

Rejection under 35 U.S.C. § 103(a)

In the Office Action, beginning at page 4, Claims 1-10 and 15 were rejected under 35 U.S.C. § 103(a), as reciting subject matters that allegedly are obvious, and therefore allegedly unpatentable, over the disclosure of U.S. Patent No. 6,114,871, issued to Shiota et al. ("Shiota"), in view of the disclosure of U.S. Patent No. 6,035,265, issued to Dister et al. ("Dister"). Applicant respectfully requests reconsideration of this rejection.

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The present application describes systems and methods embodying principles of the present invention. As discussed throughout the specification, one aspect of the present invention includes an electromagnetic (EM) sensor, exemplarily illustrated in Fig. 1, which is tuned to receive EM signals which result from discharges in an electrical machine. Another aspect of the present invention includes methods for measuring discharges in windings of electrical machines. According to exemplary embodiments of the present invention, an EM signal sensor is positioned in proximity to an electrical machine, e.g., the windings of the machine, but is not electrically connected to the machine, such that the EM signals resulting from the high frequency components of applied voltages can be detected and evaluated. As discussed in the specification, because a sensor of the present invention is an EM sensor, and as readily appreciated by the routineer skilled in the art, electrical connection between the sensor and the windings is not safe and may disrupt the sensor's ability to receive the EM signals for which it is provided. See, e.g., paragraphs [0015] and [0023] of the present specification.

Claim 1 relates to a method for measuring partial discharges in windings of electrical devices, the method including: applying voltages having high frequency components to the winding of the electrical device; detecting partial discharge signals using a plurality of tuned VHF electromagnetic sensors, UHF electromagnetic sensors, or both, being arranged at a plurality of positions close to and electrically disconnected from the electrical device to determine the position of the discharge location; or detecting partial discharge signals using one tuned VHF electromagnetic sensor, UHF electromagnetic sensors, or both, being sequentially arranged at a plurality of positions close to and electrically disconnected from the electrical device to determine the position of the discharge location; and evaluating the detected sensor signals using electrical hardware, software, or both.

The prior art, including *Shiota* and *Dister*, fails to disclose, describe, or fairly suggest the combinations recited in the pending claims.

Shiota describes an on-line testing methodology for detecting abnormalities in the windings of electrical machines, in which sensors 8a, 8b, 9 are embedded in the slots 6 of the stator winding 4 (figs. 1, 2, 3, 24), and are thus electrically connected to the windings and are

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positioned to measure discharges in the main stator insulation. *Shiota* emphasizes throughout the disclosure that they are interested in on-line measurements (*i.e.*, during 50/60 Hz feed); see, e.g., col. 4, lines 31-36. Because *Shiota* focuses on an on-line system, pulse stresses require their object to be to separate noise from the signals by means of hardware (filters, etc.); however, as the harmonic components of noise are random, these components are unknown to *Shiota*. Contrary to the methodology of *Shiota*, one aspect of the present invention includes using a well defined source of pulses, and thus the frequency harmonics of the test voltage are known and can be singled out from the partial discharge signals, since the frequency ranges of the two kinds of signals are generally different (see, e.g., Fig. 2 of the present application). Understandably, *Shiota* therefore uses band-pass filters to cancel the noise components from the detected electrical signals, while the present invention includes, *inter alia*, attenuating or eliminating the unimportant signal components (for example, those due to the pulse test voltage) from the discharge pattern by a proper tuning of the sensor. Furthermore, *Shiota* plainly describes sensors that are electrically connected and attached to the system being examined; in some embodiments, the sensors are embedded in the stator winding or wedges. In addition to being plainly different from the claimed methods, *Shiota*'s sensor position disadvantageously can only initially be chosen up to a certain degree (*e.g.*, only the part of the wedge to which the sensor is attached can be selected), after which the position of the sensor is fixed.

Dister describes impedance sensors which, according to *Dister*, measure the impedance of stator windings at frequencies relatively higher than the rated frequency of the electrical machine. See Column 3, lines 14-18. As detailed by *Dister*, an off-line test is made of the broadband signal response of the impedance of the stator windings in order to predict, according to *Dister*, what type of winding insulation failure may occur. Voltage sensors 172 and current sensors 171 are connected to each phase of the electrical device and are used to deduce the impedance of the power lines of the machine, from which *Dister* states that the 'health of the stator windings' can be judged. Indeed, this deduction of various types of winding failures tabulated in Fig. 9, according to *Dister*, is possible from the inspection of the windings' impedance alone.

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Applicant respectfully submits that one of ordinary skill in the art, upon a full and fair reading of *Shiota* and *Dister*, would not find any motivation to combine these documents' disclosures in the manner alleged to be obvious in the Office Action. While *Shiota* describes monitoring a generator in use, *Dister* describes a mere test method. Only in *Dister*'s process can a high frequency pulse be applied, while *Shiota*'s method relies on incipient high frequency components of the voltages applied to the windings when on-line. The Office Action does not make up for this enormous gap between the disclosures of *Shiota* and *Dister*, failing to even suggest how one of ordinary skill in the art would apply the off-line methods of *Dister* to the on-line methods of *Shiota*. In fact, the incorporation of *Dister*'s methodology into *Shiota*'s would likely destroy *Shiota*'s process altogether, as *Dister* incorporates low-pass filtering (see Col. 7, lines 9-33, and low-pass filter 208) to the power phases so that the higher frequency test signals *Dister* uses can be used without interference from incipient high frequency voltages. Thus, contrary to the allegations in the Office Action, the prior art teaches directly away from a combination of *Shiota* and *Dister* alleged to be obvious in the Office Action, because *Dister*'s methods would eliminate high-frequency voltage components needed in *Shiota*'s.

Assuming, *arguendo*, that one of ordinary skill in the art would nevertheless find motivation to combine the disclosures of *Shiota* and *Dister* in the manner alleged to be obvious in the Office Action, the resulting hypothetical construct would still not include each and every step recited in the combinations of the pending claims. As discussed above, neither *Shiota* nor *Dister* disclose, describe, or suggest a method including, *inter alia*, detecting signals using an EM sensor electrically disconnected from the electrical device. On the contrary, *Shiota* describes sensors 9 embedded in the electrical machine's windings, and *Dister* expressly requires electrical connections to measure voltage and current through the power phases of the electrical machine. Thus, even if the combination of *Shiota* and *Dister* were supported by a *prima facie* case, the resulting method would still fall short of the subject matters of the pending claims.

For at least the foregoing reasons, Applicant respectfully submits that the subject matters of Claims 1-10 and 15, each taken as a whole, would not have been obvious to one of ordinary skill in the art at the time of Applicant's invention, are therefore not unpatentable under 35

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U.S.C. § 103(a), and therefore respectfully requests withdrawal of the rejection thereof under 35 U.S.C. § 103(a).

New Claims

New Claims 18-21 have been added. Claims 18-21 each depend directly from Claim 1, and are therefore allowable for at least the same reasons. The subject matter of each of Claims 18-20 was derived in part from the pending claims, and from the specification at paragraphs [0015] and [0023]; accordingly, no new matter has been entered. An early indication of the allowability of Claims 18-21 is therefore respectfully requested.

Conclusion

Applicant respectfully submits that the present patent application is in condition for allowance. An early indication of the allowability of this patent application is therefore respectfully solicited.

If Ms. He believes that a telephone conference with the undersigned would expedite passage of this patent application to issue, she is invited to call on the undersigned at number below.

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It is not believed that extensions of time are required, beyond those that may otherwise be provided for in accompanying documents. If, however, additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and the Commissioner is hereby authorized to charge fees necessitated by this paper, and to credit all refunds and overpayments, to our Deposit Account 50-2821.

Respectfully submitted,

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